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User's Manual

# M38000TL2-FPD

## User's Manual

## Emulation Pod for 740 Family MCUs

Renesas Electronics
www.renesas.com

Rev.2.00 2003.11

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For inquiries about the contents of this document or product, fill in the text file the installer of the emulator debugger generates in the following directory and email to your local distributor.

\SUPPORT\Product-name\SUPPORT.TXT

Renesas Tools Homepage http://www.renesas.com/en/tools

# Preface

The M38000TL2-FPD is an emulation pod for the 740 Family of Renesas 8-bit MCUs. It is used with a PC4701 emulator.

This user's manual mainly describes specifications of the M38000TL2-FPD emulation pod and how to setup it. For details on the following products, which are used with the M38000TL2-FPD, refer to each product's user's manual.

- Emulator: PC4701 User's Manual
- Emulator debugger: M3T-PD38 User's Manual

All the components of this product are shown in "2.1 Package Components" (page 16) of this user's manual. If there is any question or doubt about this product, contact your local distributor.

## To use the product properly

### Precautions for Safety:

- Both in this User's Manual and on the product itself, several icons are used to insure proper handling of this product and also to prevent injuries to you or other persons, or damage to your properties.
- The icons' graphic images and meanings are given in "Chapter 1. Precautions for Safety". Be sure to read this chapter before using the product.

## When using outside Japan

- When using in Europe, the United States, or Canada, be sure to use both the emulator and the emulation pod which meet overseas standards. EMI standards are not met when the M38000TL2-FPD is used with the PC4700H or PC4700L emulator.

# Terminology

Some specific words used in this user's manual are defined as follows:

### Emulator system

This means an emulator system built around the PC4701 emulator. The PC4701 emulator system is configured with an emulator main unit, emulation pod, host machine and emulator debugger.

### Emulator main unit (Hereafter PC4701)

This means the generic name for emulators for 8 and 16-bit MCUs. For details on specific models of PC4701, visit Renesas Tools Homepage at http://www.renesas.com/en/tools

### Emulation pod main unit

This means the M38000TL2-FPD (this product). This emulation pod is for the 740 Family MCUs.

### Host machine

This means a personal computer used to control the emulator and emulation pod.

### Emulator debugger

This means a software tool M3T-PD38 to control the emulator from the host machine through an interface.

In this user's manual, the emulator debugger "M3T-PD38" may be represented as "PD38". Please read "M3T-PD38" for "PD38".

### Firmware

Program that analyzes contents of communication with the emulator debugger and controls the emulator hardware. This program is installed in the EEPROM. This program is downloadable from the emulator debugger to upgrade the firmware or to support other MCUs.

### Emulator MCU

This means the special package MCU for the emulator mounted on the emulation pod. This is used by connected to the tip of this product (target system side).

### Target MCU

This means the microcomputer you are going to debug.

### Target system

This means a user's application system using the MCU to be debugged.

*****

In this user's manual, this symbol is used to show active LOW. (e.g. RESET*: Reset signal)

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# Chapter 1. Precautions for Safety

This chapter describes precautions for using this product safely and properly. For precautions for the emulator main unit, the emulation pod main unit and the emulator debugger, refer to each user's manual included with your product.


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# Chapter 1. Precautions for Safety

In both the user's manual and on the product itself, several icons are used to insure proper handling of this product and also to prevent injuries to you or other persons, or damage to your properties.

This chapter describes the precautions which should be taken in order to use this product safely and properly. Be sure to read this chapter before using this product.

## 1.1 Safety Symbols and Meanings

| | |
|---|---|
| ⚠ **WARNING** | If the requirements shown in the "WARNING" sentences are ignored, the equipment may cause serious personal injury or death. |
| ⚠ **CAUTION** | If the requirements shown in the "CAUTION" sentences are ignored, the equipment may malfunction. |
| **IMPORTANT** | It means important information on using this product. |

In addition to the three above, the following are also used as appropriate.

△ means WARNING or CAUTION.

Example: ⚠ **CAUTION AGAINST AN ELECTRIC SHOCK**

⃠ means PROHIBITION.

Example: **DISASSEMBLY PROHIBITED**

● means A FORCIBLE ACTION.

Example: **UNPLUG THE POWER CABLE FROM THE RECEPTACLE.**

The following pages describe the symbols "WARNING", "CAUTION", and "IMPORTANT".

# ⚠ WARNING

## Warning for Installation:

- Do not set this product in water or areas of high humidity. Spilling water or some other liquid into the main unit can cause an unrepairable damage.

## Warnings for Use Environment:

- The emulation pod is air-cooled with the ventilation slot. Therefore, do not block the ventilation slot. When heated to high temperatures, the emulation pod may not work properly.
- This equipment is to be used in an environment with a maximum ambient temperature of 35°C. Care should be taken that this temperature is not exceeded.

# ⚠ CAUTION

## Caution to Be Taken for Modifying This Product:

- Do not disassemble or modify this product. Disassembling or modifying this product can cause damage. Disassembling and modifying the product will void your warranty.

## Cautions to Be Taken for Handling This Product:

- Use caution when handling the main unit. Be careful not to apply a mechanical shock.
- Do not touch the connector pins of the emulator main unit and the target MCU connector pins. Static electricity may damage the internal circuits.
- Do not pull the pod probe by the flexible cable for connecting to the emulator main unit or the flexible cable PCA7733 REV.B for connecting the target system. The cable may cause a break.
- The flexible cable for connecting to the emulator main unit or the flexible cable PCA7733 REV.B for connecting the target system are different from earlier models. The slits make them more flexible. However, excessive flexing or force may break conductors. Figure 1.1 (next page) shows the examples of excessively flexed cables and how to handle them.
- Do not use inch-size screws for this equipment. The screws used in this equipment are all ISO (meter-size) type screws. When replacing screws, use same type screws as equipped before.

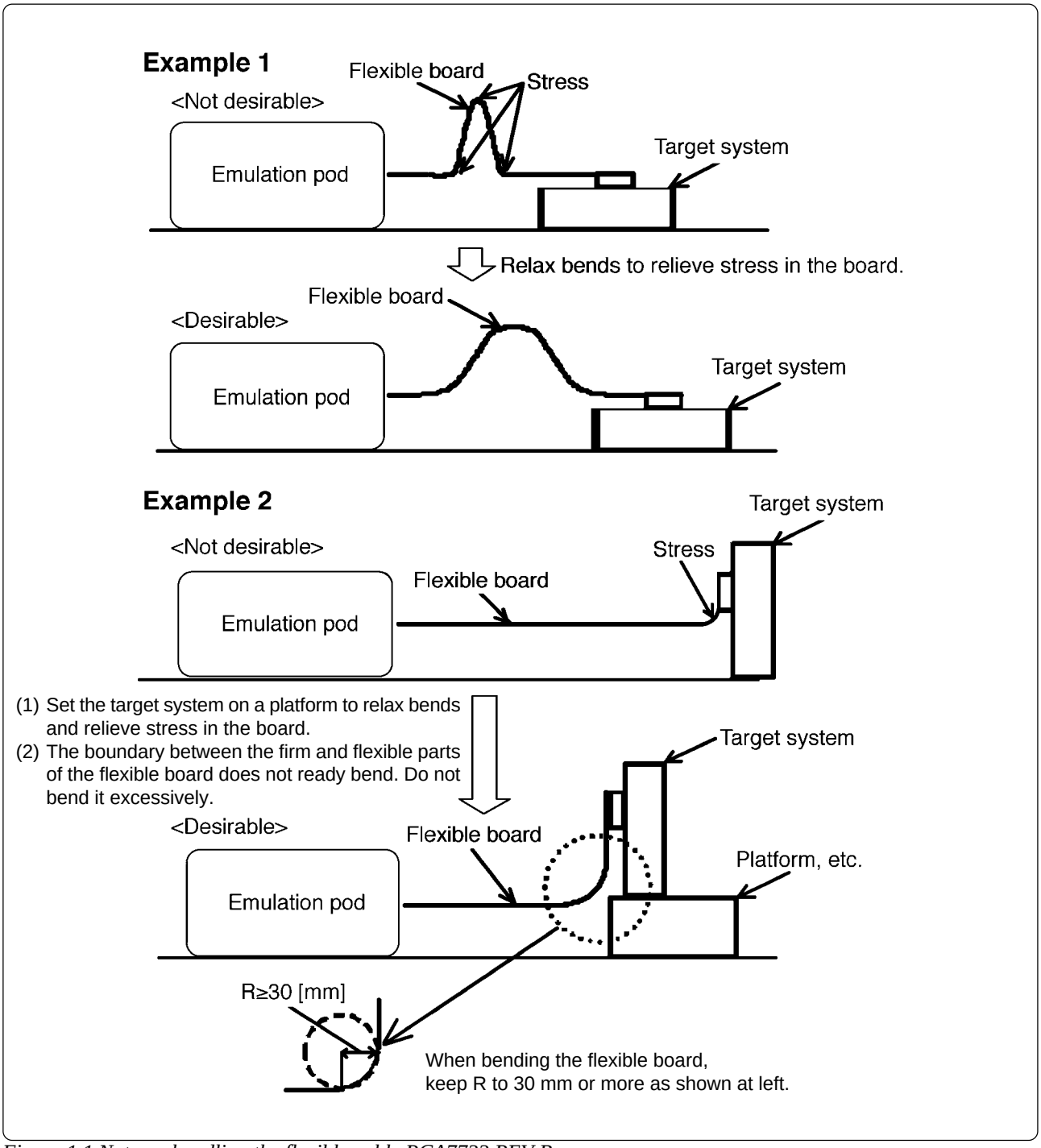
Example 1
Flexible board
Stress
<Not desirable>
Emulation pod
Target system
Relax bends to relieve stress in the board.
Flexible board
<Desirable>
Emulation pod
Target system
Example 2
Target system
<Not desirable>
Stress
Flexible board
Emulation pod
(1) Set the target system on a platform to relax bends and relieve stress in the board.
(2) The boundary between the firm and flexible parts of the flexible board does not ready bend. Do not bend it excessively.
Target system
<Desirable>
Flexible board
Platform, etc.
Emulation pod
R≥30 [mm]
When bending the flexible board,
keep R to 30 mm or more as shown at left.

*Figure 1.1 Note on handling the flexible cable PCA7733 REV.B*

# IMPORTANT

## Note on Malfunctions in the PC4701 System:

- If the emulator malfunctions because of interference such as external noise, do the following to remedy the trouble.

  (1) Press the RESET button on the emulator front panel.

  (2) If normal operation is not restored after step (1), shut OFF power to the emulator once and then reactivate it.

## Notes on Downloading Firmware:

- Before using this product for the first time, it is necessary to download the dedicated firmware (control software for the emulation pod built into the PC4701). Please note that, to do this, it is necessary to start up the PC4701 in maintenance mode. For firmware download procedures, see "4.2 Downloading Firmware" (page 34). Once the firmware has been downloaded, the product can be used by simply turning on the power.
- Do not shut off the power while downloading the firmware. If this happens, the product will not start up properly. If power is shut off unexpectedly, redownload the firmware.
- Except when a target status error occurs, if the self-check is not completed successfully, there may be trouble with the product. In such case, contact your sales representative.

## Notes on Target System:

- For starting up the emulation pod normally, the following are needed.

  (1) Connection to the emulator MCU

  (2) Power to the emulator MCU (Vcc and GND)

  - The Vcc pin is connected to the target system to observe the voltage of the target system. Therefore the emulator cannot supply the power to the target system. Design your system so that the target system is powered separately.
  - The voltage of the target system should be within the MCU's specified range and between +0.9 and 5.5 V.
  - Do not change the voltage of the target system after turning on the power.

  (3) Clock to the emulator MCU

  (4) Processing RESET pin and Vref pin (if the MCU has it)

  When debugging with M38000TL2-FPD, use either an open-drain type reset IC or a CR reset circuit. The recommended pull-up value is about 10kΩ. The MCU can be reset by outputting "L" to the target through the reset clip on the M38000TL2-FPD. However, if the reset circuit on the target is an H-output type RESET IC, it cannot be set to "L" and the emulator will not operate properly.

  According to the MCU specifications, terminate the Vref pin properly.

- Before powering on your emulator system, check that the host machine, the PC4701, converter board and target system are all connected correctly. Next, turn on the power to each equipment following the procedure below.

  (1) Turn ON/OFF the target system and the PC4701 as simultaneously as possible.
  (2) When the PC4701 and emulator debugger M3T-PD38 start up, check the target status LEDs on the emulator main unit's front panel to see if this product is ready to operate.

  (For the target status LEDs on the emulator main unit's front panel when starting up the PC4701, refer to "4.1 (3) LED Display When the PC4701 Starts Up Normally" on page 33.)

# IMPORTANT

## Note on Differences between Actual MCU and Emulator:

- Operations of the emulator differ from those of mask MCUs as listed below.

  (1) Reset condition

  (2) Initial values of internal resource data at power-on

  (3) Interrupt stack pointer after releasing reset

  (4) Internal memory (ROM and RAM) capacities, etc.

  Therefore, be sure to evaluate your system with an evaluation MCU. Before starting mask production, evaluate your system and make final confirmation with an ES (Engineering Sample) version MCU.

## Notes on Watchdog Function:

- The MCU's watchdog timer can be used only while programs are being executed. To use it otherwise, disable the watchdog timer.
- If the reset circuit of the target system has a watchdog timer, disable it when using the emulator.

## Notes on Internal Resources of MCU:

- In the MCU's internal RAM area, single-step and break operations cannot be performed.
- When using the 38000 Series emulator MCU, note that addresses $FFFE and $FFFF cannot be used. When using any MCU other than the 38000 Series, you cannot use addresses $8000 and $8001.

## Note on Software Breaks:

- Software breaks generate break interruptions by forcibly inserting a BRK instruction "00h" instead of an instruction code. Therefore, when referencing the result of a trace in bus mode, "00h" is displayed for the instruction fetch address where a software break is set.

# IMPORTANT

## Note on Interruption:

- While the program is paused, interrupts are made by running a selected address loop. For this reason, timers and other functions are not stopped while the program is paused (including while debug programs are running).

  If an interrupt request is generated at any time other than when the program is being executed (while the user program is paused or a debug program is running), the interrupt is not generated because the emulator disables interrupts. However, the interrupt request bit is not cleared.

## Notes on MAP References and Settings:

- When starting up the M38000TL2-FPD, initial MAP settings are as follows.

  0000h--3FFFh: EXT
  4000h--FFFFh: INT (emulation memory available)

- Be sure to set the internal RAM of MCU and SFR area to "EXT".
- When the RAM area of the target MCU is larger than the RAM in the emulator MCU, set the marginal area to "INT".

## Notes on Stack Area:

- With this product, a maximum 3 bytes of the user stack is consumed as a work area.
- If the user stack area does not have enough area, do not use areas which cannot be used as stack (SFR area, RAM area which stores data, or ROM area) as work area. Using areas like this is a cause of user program crashes and destabilized emulator control. Therefore, ensure the +3 bytes maximum capacity used by the user program as the user stack area.
- With this product, the address listed in MCU file is used as stack area after the reset is released.

## Note on When the Emulator Debugger Ends:

- To restart the emulator debugger after it ends, always shut power to the emulator module off once and then on again.

## Notes on Connecting the Target System:

- When connecting the PCA7733 REV.B flexible board and the probe direction converter board, be careful not to forcibly press the top of the J1 part of the PCA7733 REV.B flexible board. (The J1 connector is guaranteed for only 20 insertion/removal iterations.)
- Especially be careful not to insert the J1 connector in the wrong direction.

# MEMO

# Chapter 2. Preparation

This chapter describes the package components, the system configuration and the preparation for using this product for the first time.

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2.2 Other Tool Products Required for Development ..... 16
2.3 Name of Each Part ..... 17
2.4 When Using the Emulator for the First Time ..... 18

# Chapter 2. Preparation

## 2.1 Package Components

This product consists of the following items. When unpacking, check to see if your product package contains all of these items.

*Package components*

| Item | Quantity |
|---|---|
| M38000TL2-FPD emulation pod main unit | 1 |
| PCA7733 REV.B flexible cable for connecting the PC4701 | 1 |
| 28DP-WS 28-pin DIP-type probe direction converter board | 1 |
| 32LCC-S 32-pin LCC-type probe direction converter board | 1 |
| M38000TL2-PSW RESET, GND and Vcc cables with overcurrent protective circuits | 1 |
| Screws for securing the PC4701 | 2 |
| Hardware tool user registration FAX sheet (English) | 1 |
| Hardware tool user registration FAX sheet (Japanese) | 1 |
| M38000TL2-FPD User's Manual (this manual) | 1 |
| M38000TL2-FPD User's Manual (Japanese) | 1 |

Please keep the M38000TL2-FPD's packing box and cushion material in your place for reuse at a later time when sending your product for repair or other purposes. Always use these packing box and cushion material when transporting the M38000TL2-FPD.

If any of these items are missing or found faulty, please contact your local distributor. Also, if there is any question or doubt about the packaged product, contact your local distributor.

## 2.2 Other Tool Products Required for Development

To bring forward programs development on the 740 Family MCUs, the products listed below are necessary in addition to the package components listed above. Get them separately.

*Other tool products*

| | |
|---|---|
| Emulator main unit | PC4701 |
| Emulator debugger | M3T-PD38 |
| Emulator MCUs | M3xxxxRSS/RFS (RLSS/RLFS) |
| Temporary target board | M3xxxxT-ADS/ADF<br>(required when the target system is not connected) |
| Converter board | A converter board for your MCU is required. For details on the converter board, refer to "3.4 Connecting the Emulator MCU" (page 23) or the Accessory Guide. |

To purchase these products, contact your local distributer.

## 2.3 Name of Each Part

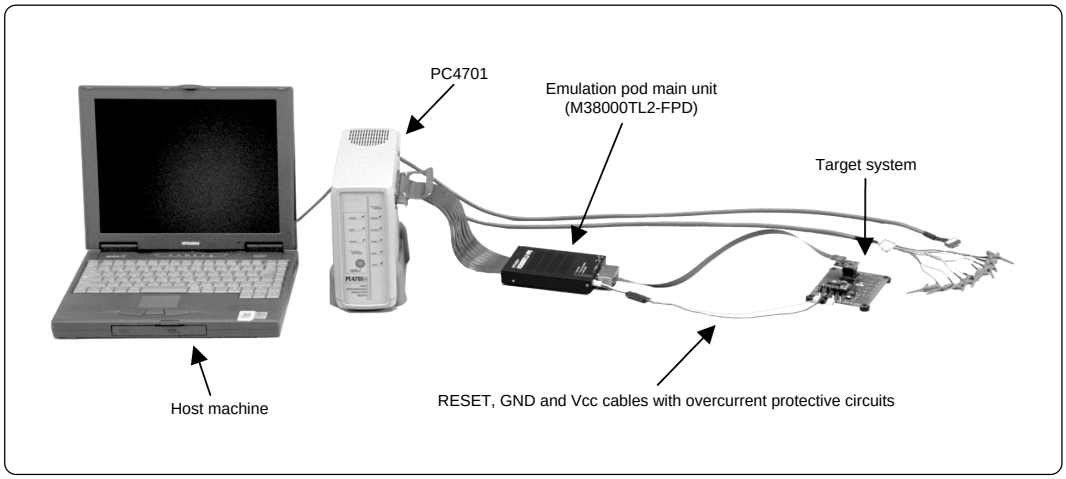



*Figure 2.1 System configuration*

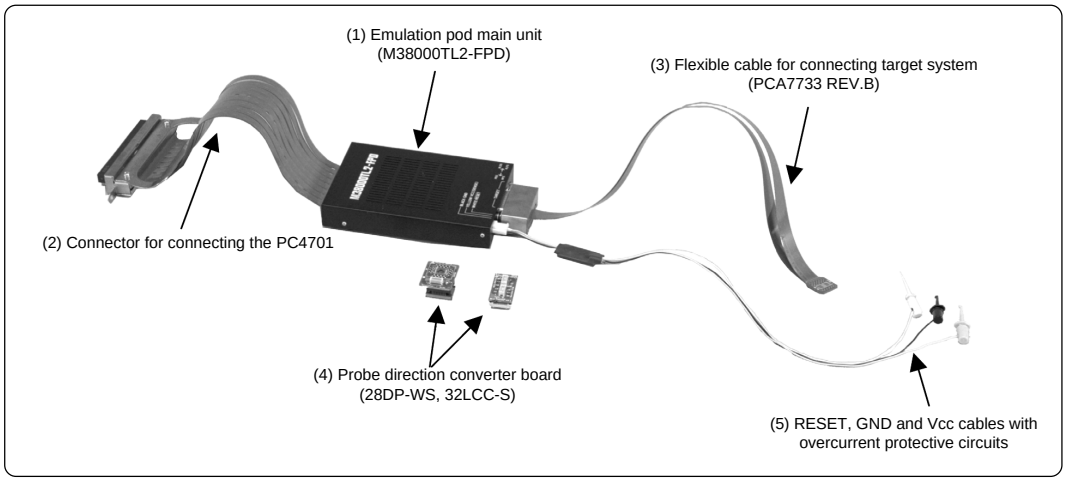

(1) Emulation pod main unit
(M38000TL2-FPD)
(3) Flexible cable for connecting target system
(PCA7733 REV.B)
(2) Connector for connecting the PC4701
(4) Probe direction converter board
(28DP-WS, 32LCC-S)
(5) RESET, GND and Vcc cables with
overcurrent protective circuits

*Figure 2.2 M38000TL2-FPD*

(1) Emulation pod (M38000TL2-FPD)

This emulation pod contains an evaluation MCU, emulation memory and circuit to feature the debugging functions.

(2) Connector for connecting the PC4701

This 120-pin flexible cable connects the PC4701 emulator and the emulation pod.

(3) Flexible cable for connecting target system (PCA7733 REV.B)

This cable connects the emulation pod and target system.

(4) Probe direction converter board (28DP-WS, 32LCC-S)

These are the pitch converter and direction converter boards. For details, refer to "3.4 Connecting the Emulator MCU" (page 23).

(5) RESET, GND and Vcc cables

Cables for connecting RESET, GND and Vcc pins on the target system. For details, refer to "3.6 M38000TL2-PSW (RESET, GND and Vcc Cables with Overcurrent Protective Circuits)" (page 27).

## 2.4 When Using the Emulator for the First Time

If you have purchased this emulation pod newly, it is necessary to download the firmware. The download procedure is given in Figure 2.3.

Before attempting to download the firmware, check the emulator debugger is installed and the emulator is connected to the host machine. For more information, see each user's manual of the emulator debugger and the PC4701.

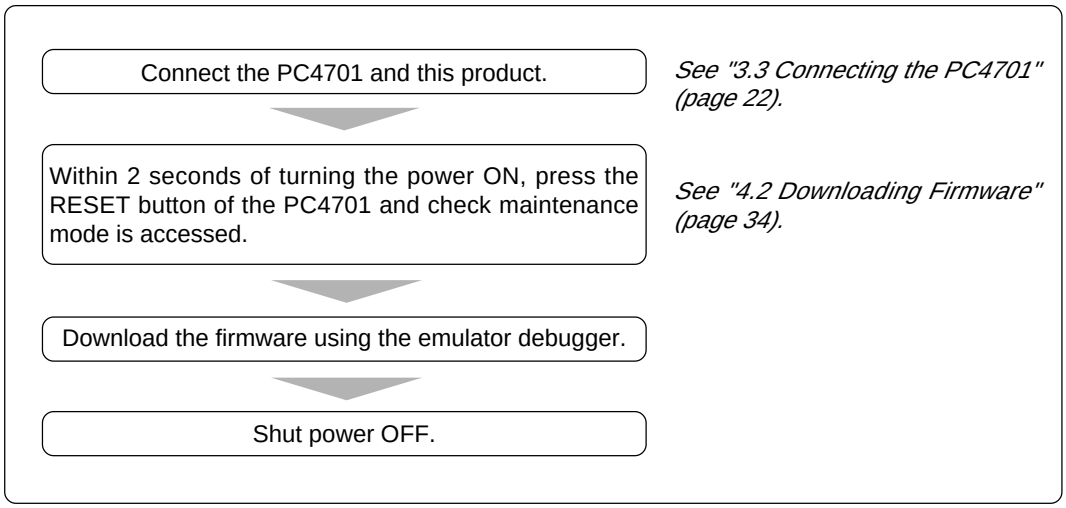

Connect the PC4701 and this product.
See "3.3 Connecting the PC4701" (page 22).
Within 2 seconds of turning the power ON, press the RESET button of the PC4701 and check maintenance mode is accessed.
See "4.2 Downloading Firmware" (page 34).
Download the firmware using the emulator debugger.
Shut power OFF.

*Figure 2.3 Firmware download procedure when emulator is used for the first time*

To make sure the emulation pod works properly, run the self-check. For self-check procedures, see "4.3 Self-check" (page 35).

# Chapter 3. Setting Up

This chapter describes switch settings required for using this product and how to connect this product to the PC4701 and the target system.


3.1 Switch Settings ..... 20
3.2 Selecting Clock Supply ..... 21
3.3 Connecting the PC4701 ..... 22
3.4 Connecting the Emulator MCU ..... 23
(1) When Emulator MCU is an RSS or RLSS Chip ..... 24
(2) When Emulator MCU is an RFS or RLFS Chip with Screw-lock ..... 25
(3) When Emulator MCU is an RFS or RLFS Chip without Screw-lock ..... 26
3.5 Connecting the Target System ..... 26
3.6 M38000TL2-PSW (RESET, GND and Vcc Cables with Overcurrent Protective Circuits) ..... 27
(1) Functions of Each Part of the M38000TL2-PSW ..... 27
(2) Connecting the M38000TL2-PSW to the M38000TL2-FPD ..... 28
(3) Connecting the M38000TL2-PSW to the Target System ..... 29
(4) LED Display ..... 30
3.7 Reset Circuit of the Target System ..... 30

# Chapter 3. Setting Up

With this product, it is necessary to set switches of the emulation pod and connect the RESET, GND and Vcc cables according to your target system.

## 3.1 Switch Settings

The M38000TL2-FPD is designed for use with the RSS/RFS and RLSS/RLFS chips*[1] in the 740 Family MCUs.

The MCU type select switch (SW1) is used to switch the emulator MCU's operating supply voltage sense input and feeding supply voltage output via Vcc cable. You need to set up the MCU type select switch and modify the connection of Vcc cable depending on the type of your emulator MCU.

*1 RLSS/RLFS represent the names of emulator MCUs that can operate with a supply voltage of less than 2.0 V.

(1) When the type of the emulator MCU is M3xxxxRLSS or M3xxxxRLFS:
Set SW1 to the RLSS side and connect the Vcc cable to the Vcc on the target system.

(2) When the type of the emulator MCU is M3xxxxRSS or M3xxxxRFS:
Set SW1 to the RSS side and do not connect Vcc cable.

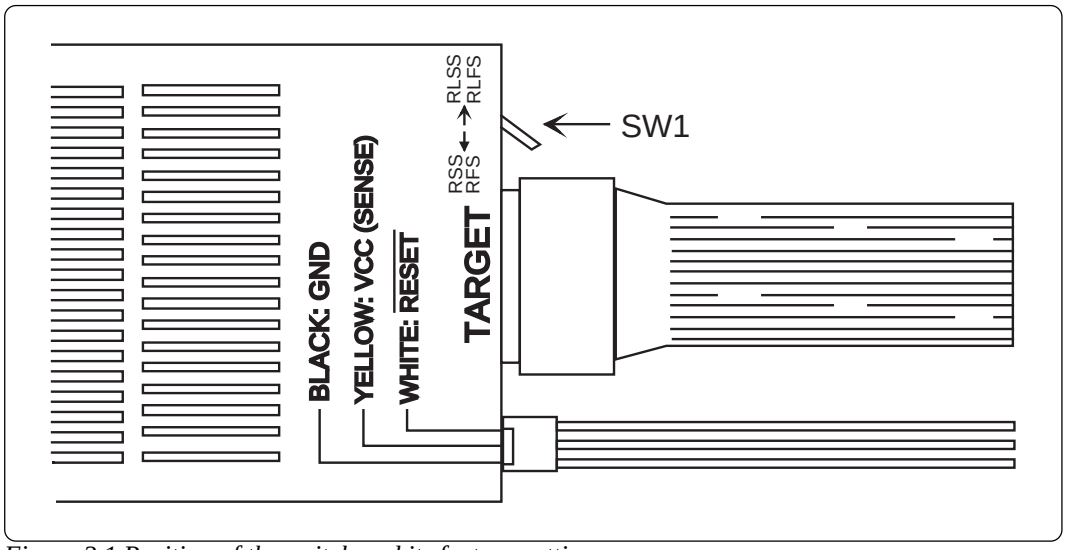



*Figure 3.1 Position of the switch and its factory-setting*

*Table 3.1 Switch setting of the M38000TL2-FPD*

| Setting | Description |
|---|---|
| RSS/RFS side | When the emulator MCU is RSS/RFS type |
| RLSS/RLFS side | When the emulator MCU is RLSS/RLFS type |

## 3.2 Selecting Clock Supply

With this product, the oscillator circuit on the target system is always used to supply a clock to the MCU. To select the clock supply on the emulator debugger is invalid.

# IMPORTANT

## Note on Changing the Clock Supply:

- With the M38000TL2-FPD, it is fixed to use the oscillator circuit on the target system as a clock supply. Make note of the fact that the setting by Init dialog when starting up the emulator debugger or inputting CLK command on the script window is invalid.

## 3.3 Connecting the PC4701

To connect the emulation pod to the PC4701, use the 120-pin flexible cable included with this product package. Connect the PC4701 side connector of the 120-pin flexible cable to the cable connector of the PC4701, then secure with screws.

Figure 3.2 shows how to connect the PC4701 and 120-pin flexible cable.

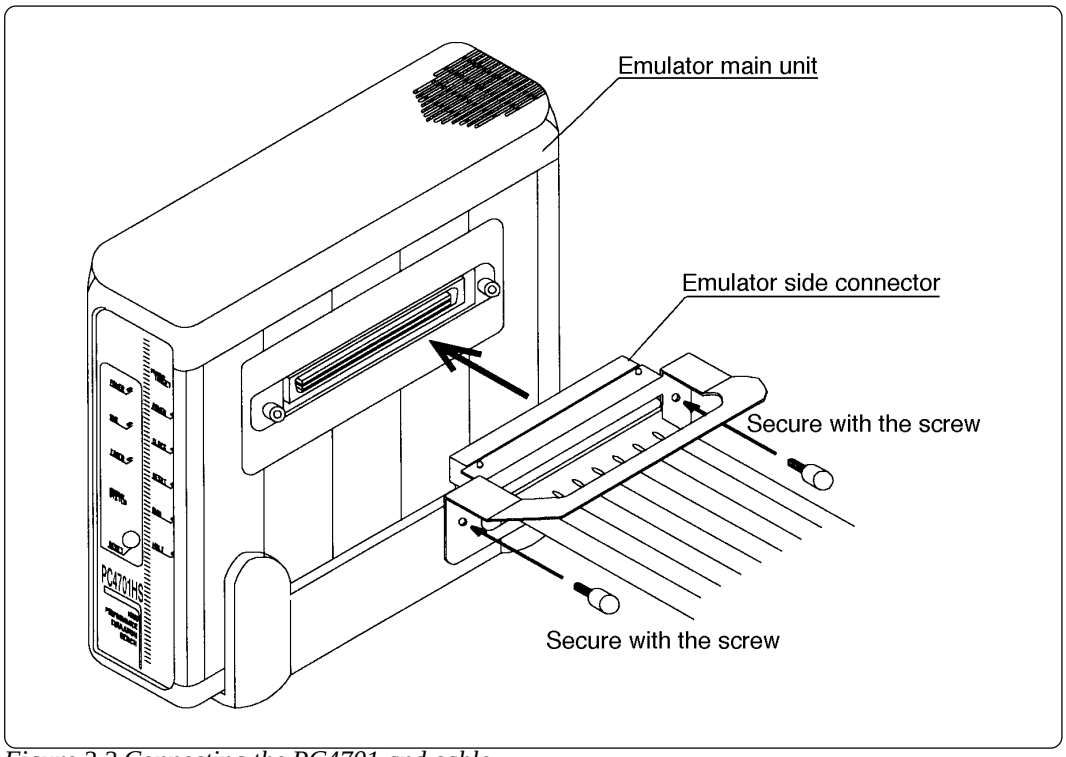



*Figure 3.2 Connecting the PC4701 and cable*

## ⚠CAUTION

### Note on Connecting the Cable:

- Always shut OFF power before connecting the cable. The power ON state could destroy internal circuits.

### Note on Securing the Screws:

- After connecting the emulator main unit to the cable, be sure to secure the screws.

## 3.4 Connecting the Emulator MCU

There are following three methods to connect the emulator MCU and M38000TL2-FPD, so you can choose the appropriate method depending on the type of an emulator MCU.

(1) When the emulator MCU is an RSS or RLSS chip
(2) When the emulator MCU is an RFS or RLFS chip with screw-lock
(3) When the emulator MCU is an RFS or RLFS chip without screw-lock

For methods (1) and (3), use the 28DP-WS board as the probe direction converter board; for method (2), use the 32LCC-S board. Figures 3.3 and 3.4 show the top view of the 28DP-WS and that of the 32LCC-S, respectively.

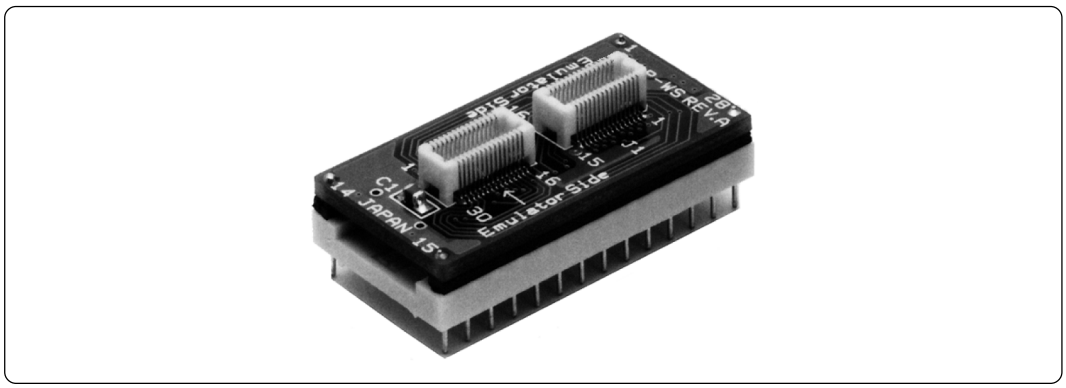



*Figure 3.3 External view of the 28DP-WS (included)*

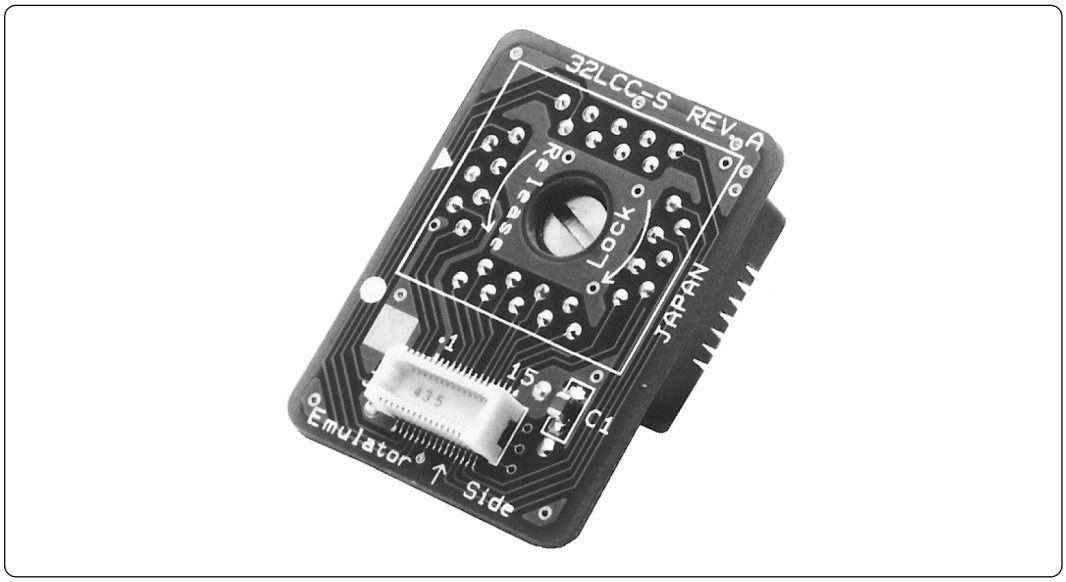
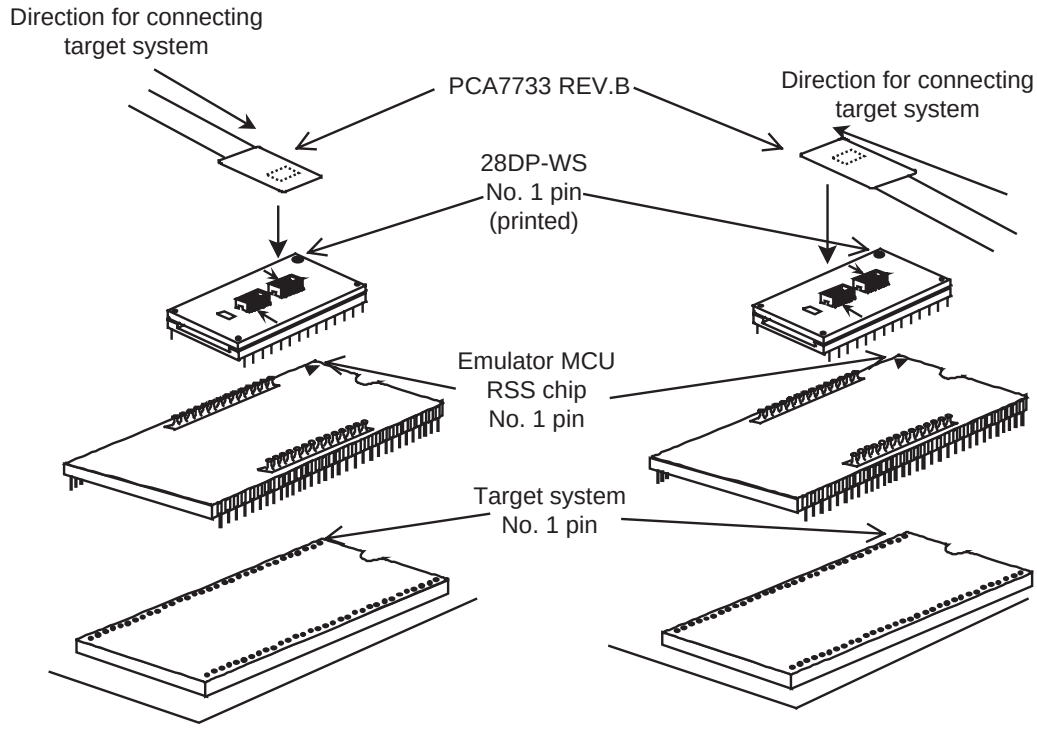



*Figure 3.4 External view of the 32LCC-S (included)*

### (1) When Emulator MCU is an RSS or RLSS Chip

If the emulator MCU is an RSS or RLSS chip, use the 28DP-WS board as the probe direction converter board to connect with the target system. When connecting, match the No. 1 pin of the 28DP-WS, emulator MCU and target system. When using the 28DP-WS board, you can choose one of two methods of connection that is matched to the direction of the emulator MCU on the target system. Figure 3.5 shows each method of connection.


Direction for connecting target system
PCA7733 REV.B
Direction for connecting target system
28DP-WS No. 1 pin (printed)
Emulator MCU RSS chip No. 1 pin
Target system No. 1 pin

Pin numbers in the diagram indicate the probe direction converter board's pin numbers that are connected to the emulator MCU.

*Figure 3.5 Connecting the M38000TL2-FPD and RSS/RLSS chip*

### (2) When Emulator MCU is an RFS or RLFS Chip with Screw-lock

If the emulator MCU is an RFS or RLFS chip with a screw-lock, use the 32LCC-S board as the probe direction converter board to connect with the target system.

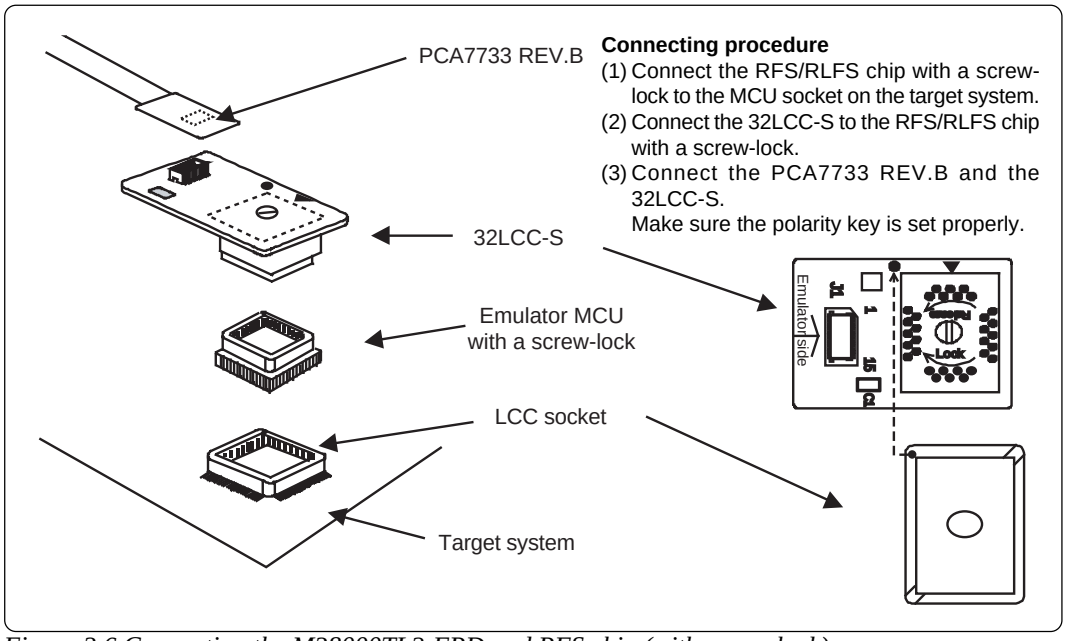

PCA7733 REV.B
Connecting procedure
(1) Connect the RFS/RLFS chip with a screw-lock to the MCU socket on the target system.
(2) Connect the 32LCC-S to the RFS/RLFS chip with a screw-lock.
(3) Connect the PCA7733 REV.B and the 32LCC-S.
Make sure the polarity key is set properly.
32LCC-S
Emulator MCU with a screw-lock
LCC socket
Target system
Emulator side
J1
1
15
J2
Lock

*Figure 3.6 Connecting the M38000TL2-FPD and RFS chip (with screw-lock)*

### (3) When Emulator MCU is an RFS or RLFS Chip without Screw-lock

If the emulator MCU is an RFS or RLFS chip without a screw-lock, use the 28DP-WS board as the probe direction converter board and the PCA4933 (separately available) to connect with the target system.

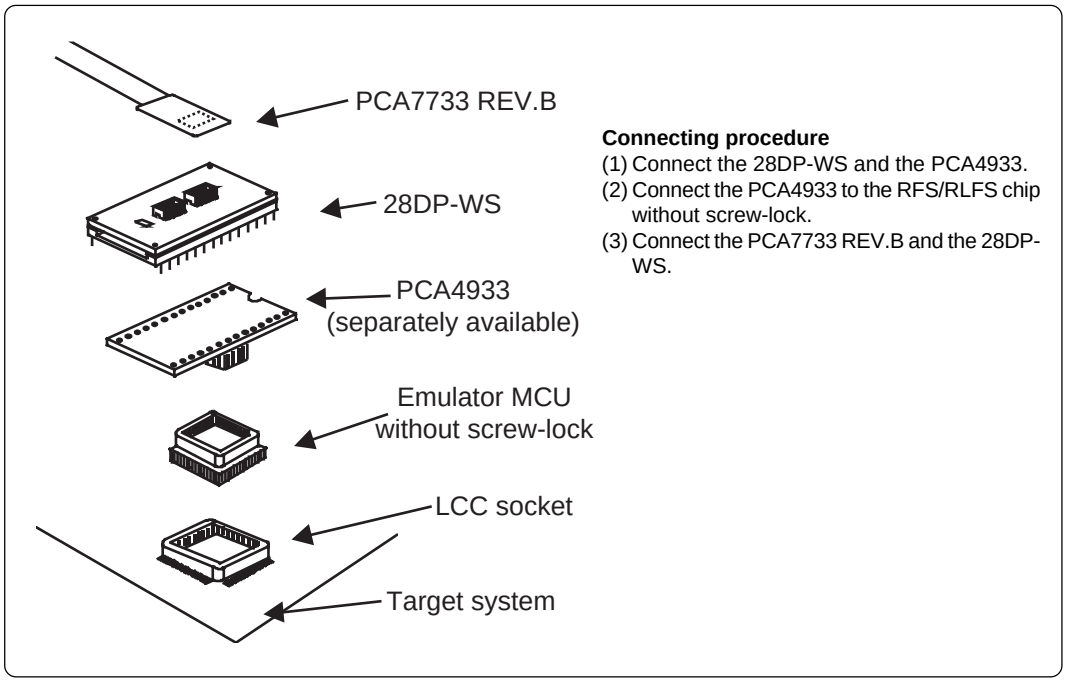



*Figure 3.7 Connecting the M38000TL2-FPD and RFS chip (without screw-lock)*

## ⚠ CAUTION

### Notes on Connecting the Target System:

- Always shut OFF power before connecting the target system. The power ON state could destroy internal circuits.
- The small connector J1 on the tip of the PCA7733 REV.B is guaranteed for only 20 insertion/removal iterations.
- Take care not to attach the converter board in a wrong direction. It may cause a fatal damage to the emulation pod.

## 3.5 Connecting the Target System

Use the suitable converter for your package to connect the emulator MCU and the target system.

For details on the connection to the target system, refer to the Accessory Guide at the URL below.

**http://www.renesas.com/en/tools**

## 3.6 M38000TL2-PSW (RESET, GND and Vcc Cables with Overcurrent Protective Circuits)

The M38000TL2-PSW is an upgraded version of the RESET, GND and Vcc cables with protective circuits added for prevention of possible damage to the M38000TL2-FPD in case the cables are improperly connected.

### (1) Functions of Each Part of the M38000TL2-PSW

Here following explains the function of each part of the M38000TL2-PSW.

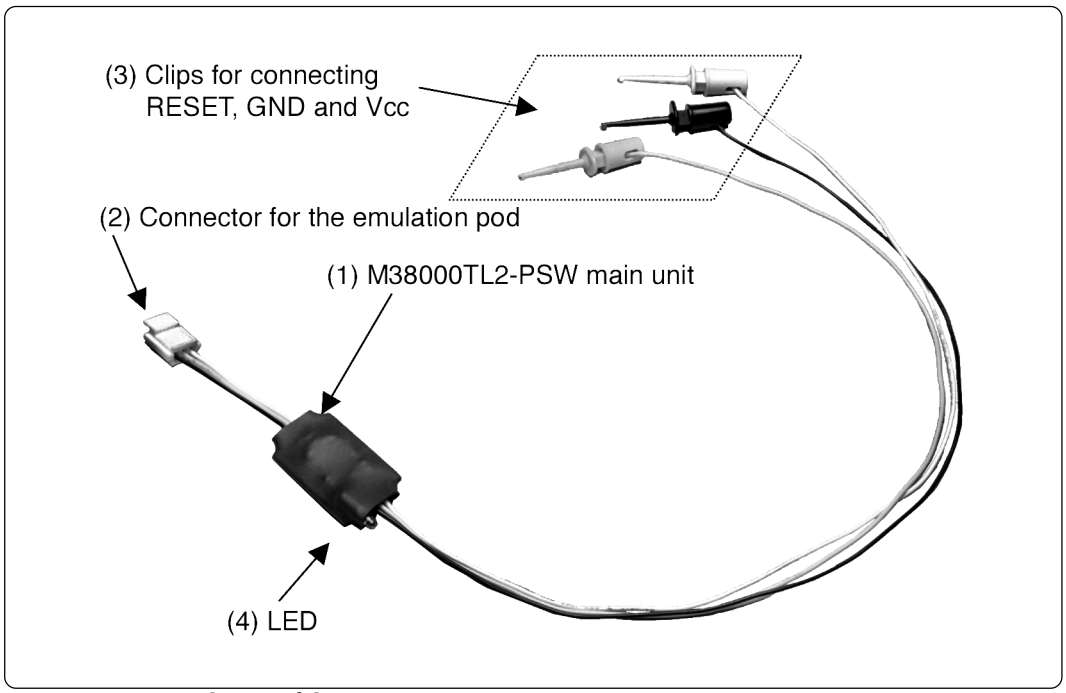



*Figure 3.8 External view of the M38000TL2-PSW*

(1) M38000TL2-PSW main unit

Prevents the M38000TL2-FPD from getting damaged when the reset, GND, and Vcc cables are erroneously connected.

(2) Connector for the emulation pod

This is a 3-pole connector used to connect the M38000TL2-PSW and M38000TL2-FPD.

(3) Clips for connecting RESET, GND and Vcc

These clips connect to the RESET input, Vcc, and GND pins on the target system. They consist of RESET (white), Vcc (yellow), and GND (black).

(4) LED

Turns off to alert you when Vcc and GND are shorted. For details, refer to "3.6 (4) LED Display" (page 30).

### (2) Connecting the M38000TL2-PSW to the M38000TL2-FPD

Connect the M38000TL2-PSW to the M38000TL2-FPD. Connect the connector matching the color of the M38000TL2-PSW's each cable and the color display on the M38000TL2-FPD (see Figures 3.9 and 3.10).

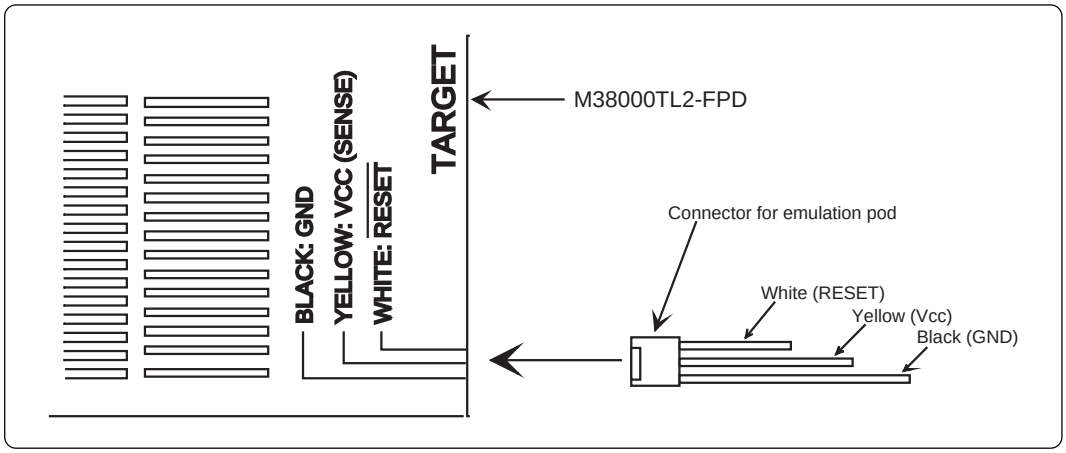



*Figure 3.9 Connecting the M38000TL2-FPD*

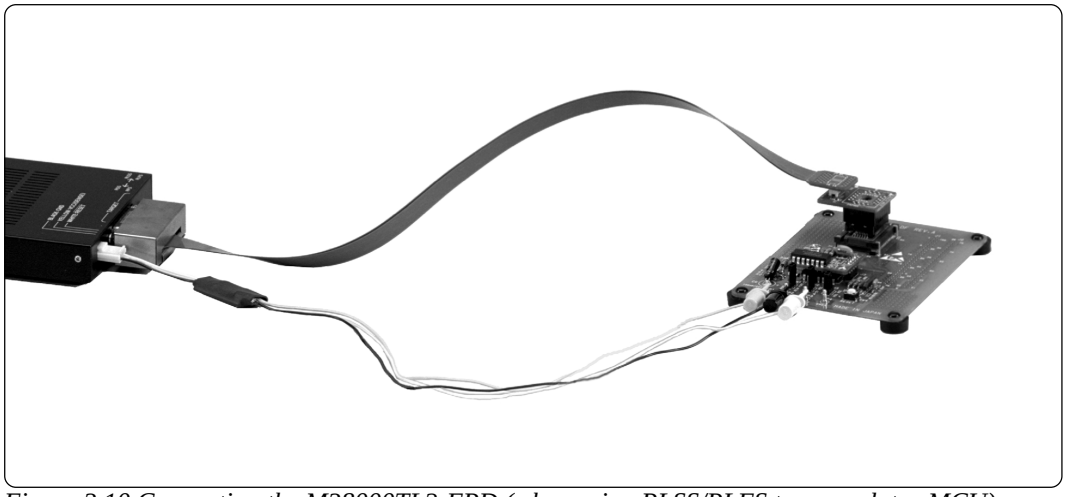


*Figure 3.10 Connecting the M38000TL2-FPD (when using RLSS/RLFS type emulator MCU)*

### (3) Connecting the M38000TL2-PSW to the Target System

Connect the clips for RESET, GND and Vcc on the tip of the M38000TL2-FPD's three-color cables to the RESET, GND and Vcc pins on the target system.

(1) Reset cable (white)
(2) GND cable (black)
(3) Vcc cable (yellow)

These three types of cables are connected differently depending on how the MCU type select switch (SW1) is set. Table 3.2 lists the SW1 settings and the connection of the RESET, GND and Vcc cables. Figures 3.11 and 3.12 show how to connect the cables.

*Table 3.2 Connecting RESET, GND and Vcc cables*

| | RESET (white) | GND (black) | Vcc (yellow) |
|---|---|---|---|
| SW1 set to RSS/RFS | Connect to the RESET pin on the target system. | Connect to the GND pin. | Not connected |
| SW1 set to RLSS/RLFS | Connect to the RESET pin on the target system. | Connect to the GND pin. | Connect to the Vcc pin. |

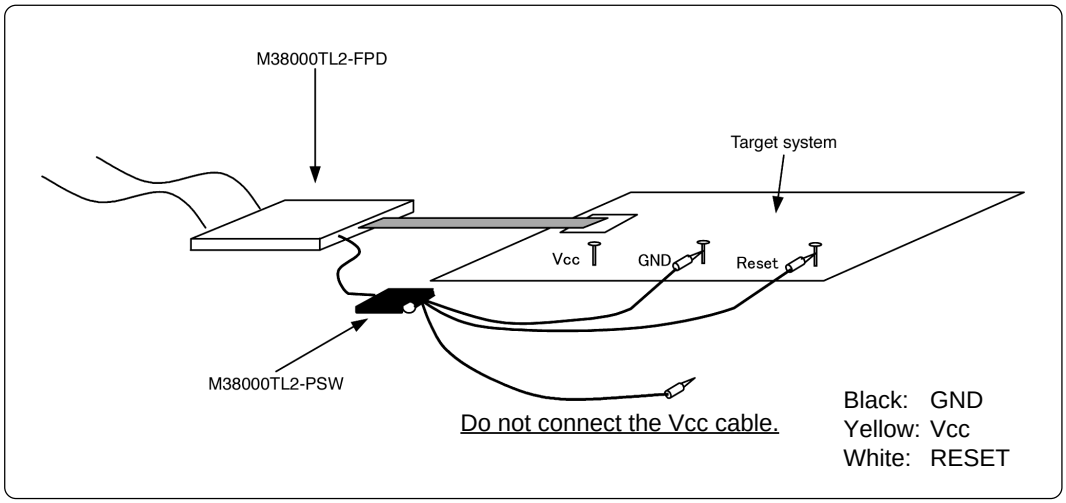



*Figure 3.11 Connecting three cables when SW1 is set to RSS/RFS*

Note: When SW1 is set to RSS/RFS, do not connect the Vcc cable.

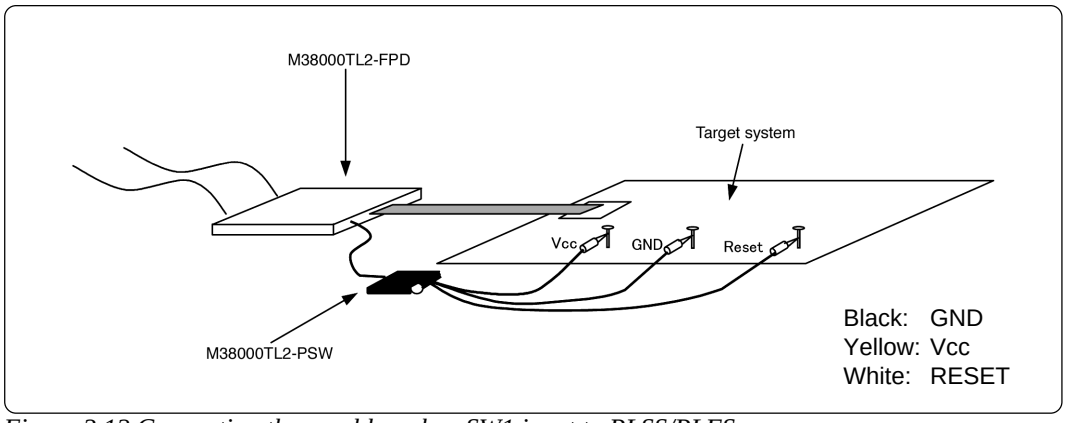



*Figure 3.12 Connecting three cables when SW1 is set to RLSS/RLFS*

### (4) LED Display

The M38000TL2-PSW turns off the LED to alert you when Vcc and GND are mistakenly connected. The M38000TL2-PSW may become hot when Vcc and GND are mistakenly connected. If so, immediately turn off the power and check whether these pins are connected correctly.

The LED does not go out when Vcc and RESET or GND and RESET are mistakenly connected. However, because in this case the emulator system cannot be started, immediately turn off the power to the emulator and target system and check whether these pins are connected correctly. Also, because the emulator system may probably be unable to start for some other reasons, refer to "Chapter 6. Troubleshooting" (page 41).

* When the voltage of the target system is lower than 3.3 V, the LED lights darkly or does not light even in normal operation.

## 3.7 Reset Circuit of the Target System

When debugging with M38000TL2-FPD, use either an open-drain type reset IC or a CR reset circuit. The recommended pull-up value is about 10kΩ. The MCU can be reset by outputting "L" to the target through the reset clip on the M38000TL2-FPD. However, if the reset circuit on the target is an H-output type RESET IC, it cannot be set to "L" and the emulator will not operate properly.

Figure 3.13 shows the connection diagram of the internal reset circuit of the emulation pod.

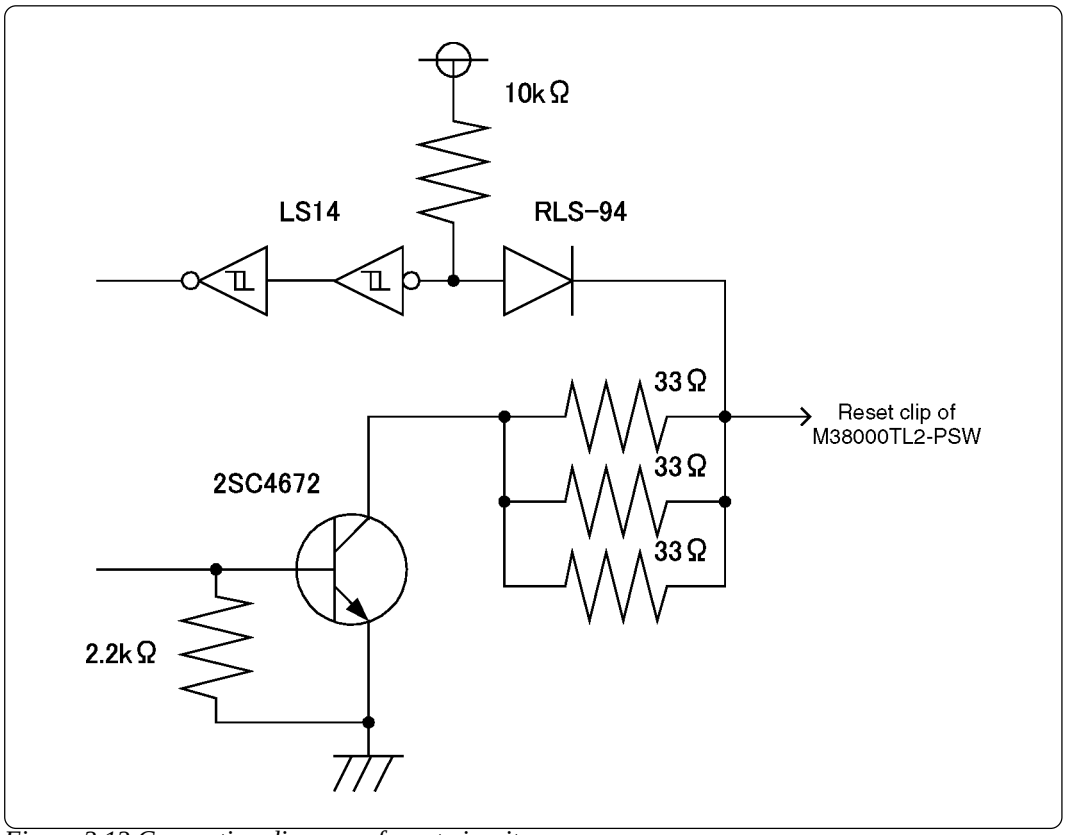



*Figure 3.13 Connection diagram of reset circuit*

# Chapter 4. Usage

This chapter describes from turning on the power of this product to starting up the emulator debugger.


4.1 Turning On the Power Supply ..... 32
(1) Checking the Connection of the System ..... 32
(2) Turning On the Power Supply ..... 32
(3) LED Display When the PC4701 Starts Up Normally ..... 33
4.2 Downloading Firmware ..... 34
(1) When It is Necessary to Download Firmware ..... 34
(2) Downloading Firmware in Maintenance Mode ..... 34
4.3 Self-check ..... 35
(1) Self-check Procedure ..... 35
(2) If an Error is Detected in the Self-check ..... 35

# Chapter 4. Usage

## 4.1 Turning On the Power Supply

### (1) Checking the Connection of the System

Before turning the power ON, check the connection of the PC4701, emulation pod, converter board and target system.

### (2) Turning On the Power Supply

Power ON/OFF the target system and the PC4701 as simultaneously as possible.

**⚠ CAUTION**

**Notes on Power Supply:**

- The emulator's $V_{CC}$ pin is connected to the target system in order to monitor target system voltage. For this reason, the emulator cannot supply power to the target system. Therefore, provide the target system with a separate power supply from that of the emulator.
- Keep target system power supply voltage within the MCU's specified range and between +0.9 and 5.5 V.
- Do not change target system power supply voltage after power has been activated.

### (3) LED Display When the PC4701 Starts Up Normally

After the emulator starts up, check the status of the LEDs on the front panel to see whether emulation pod operation is enabled or not. Figure 4.1 shows front panel LED lighting status when the emulator is turned ON.

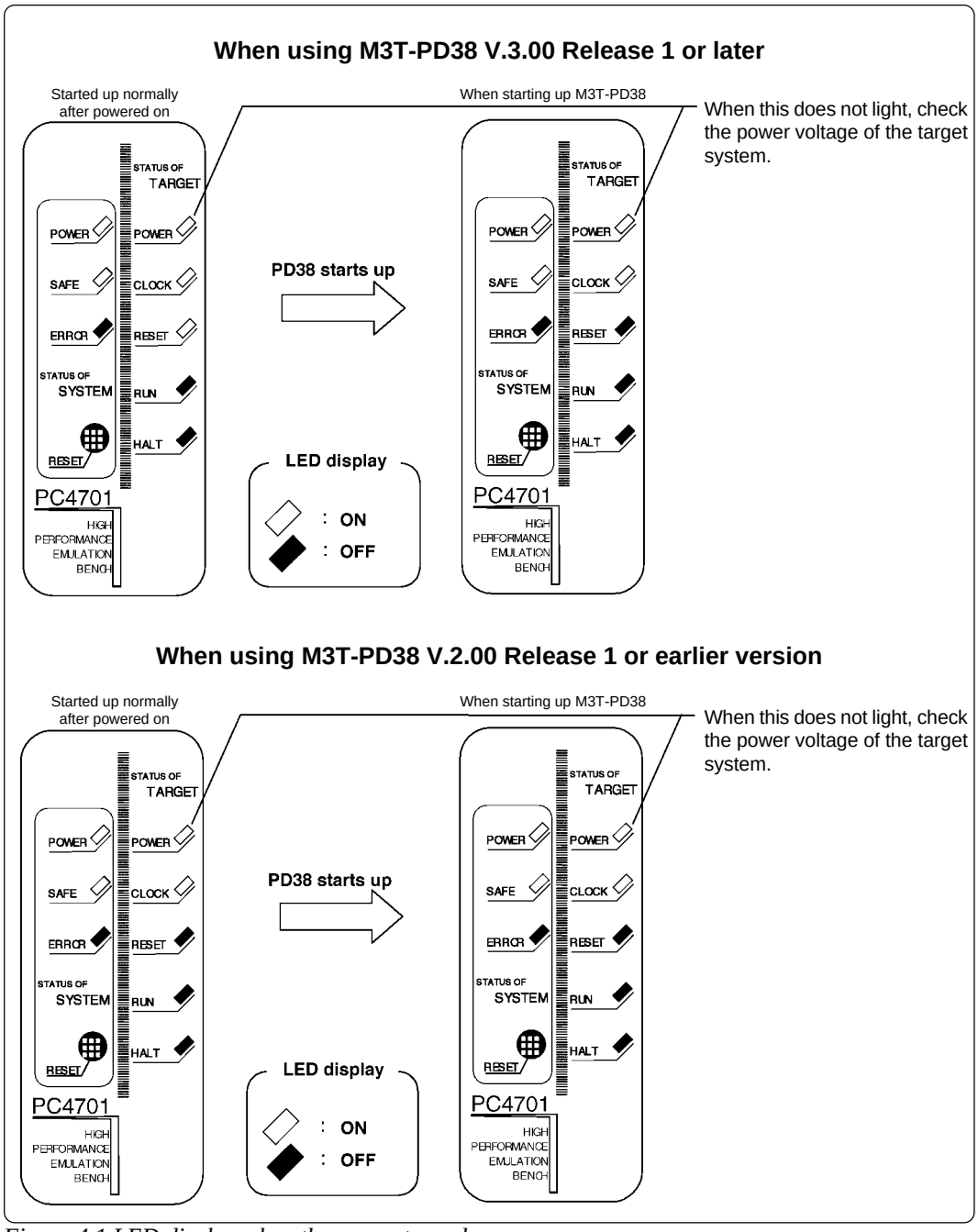



*Figure 4.1 LED display when the power turned on*

## 4.2 Downloading Firmware

### (1) When It is Necessary to Download Firmware

It is necessary to download firmware when:

(1) you use this product for the first time
(2) the firmware has been upgraded
(3) the emulator debugger has been upgraded
(4) you use this product with the PC4701 which was used with other emulation pod before

### (2) Downloading Firmware in Maintenance Mode

Download the firmware in maintenance mode as explained here following.

(1) Within 2 seconds of activating power to the emulator, press the RESET button on the emulator front panel. This will switch the emulator to maintenance mode.
(2) Start up the emulator debugger. When the Init dialog box setup is completed, the dialog which urges to download the firmware will appear. Download the firmware following messages. Required time for downloading the firmware depends on the connection of the interface.

- For serial interface ..... About 7 minutes
- For parallel interface ..... About 30 seconds

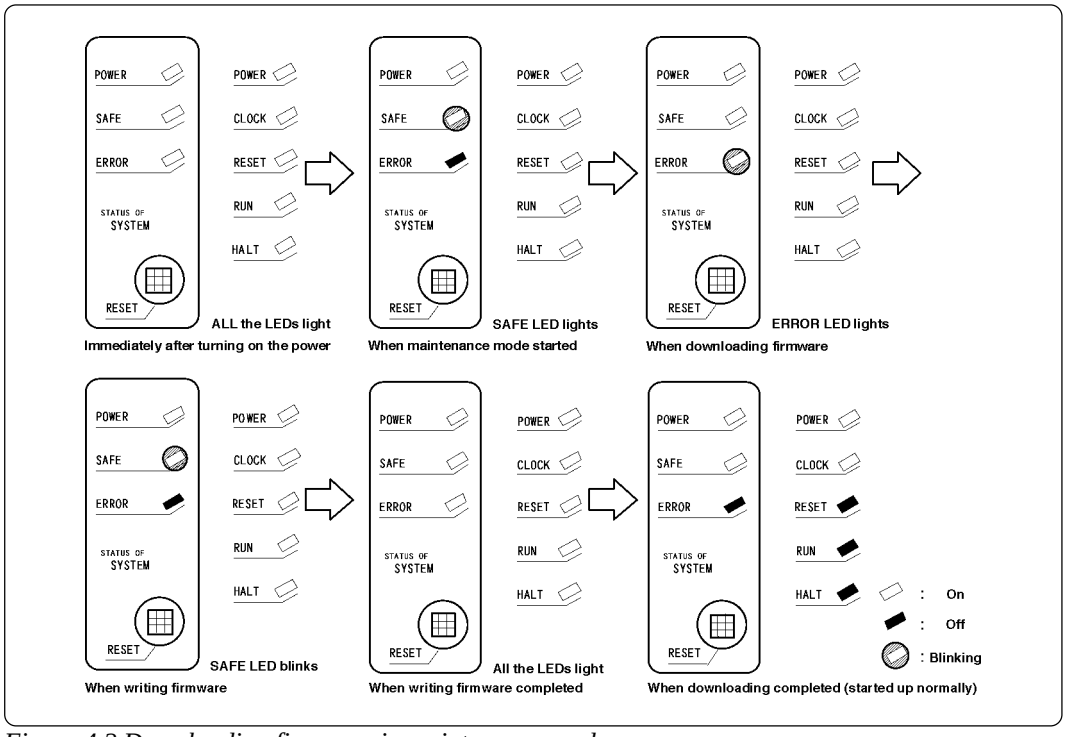



*Figure 4.2 Downloading firmware in maintenance mode*

## ⚠CAUTION

### Note on Downloading Firmware:

- Do not shut OFF power while the firmware is being downloaded. Doing so, the emulator will not start up properly. If power is shut OFF by mistake, redownload the firmware in maintenance mode.

## 4.3 Self-check

### (1) Self-check Procedure

To run the emulator self-check, do so as explained here below. While the self-check is in progress, LEDs will change as shown in Figure 4.3.

(1) Set the switches in the emulation pod same as the factory-setting (see "Table 3.1 Switch settings of the M38000TL2-FPD" on page 20).
(2) Within 2 seconds of activating power to the emulator, press the RESET button on the emulator front panel to switch the emulator to maintenance mode.
(3) Check the "SAFE" LED starts flashing and then press the RESET button again.
(4) The self-check will start. If the normal result is displayed in about 2 minutes, the self-check has terminated normally.

### (2) If an Error is Detected in the Self-check

If the self-check does not result normally (ERROR 1 or ERROR 2 in Figure 4.3), check the following.

- Emulation pod connection status

  Check if the emulation pod correctly connected to the emulation pod connector of the PC4701. Firmly tighten up the connector with the screws (white) included with the emulation pod.

- Matching of the emulation pod and firmware

  If the emulator debugger shows an instruction for downloading the firmware when it started up, download the firmware that matches the emulation pod according to the displayed message. For firmware names that conform to the emulation pod used, refer to "4.2 Downloading Firmware" (page 34).

- Target MCU (emulator MCU) status

  - Check if the emulator MCU correctly connected to the target system.
  - Check if the emulator MCU supplied with the power (within the rated voltage range) and clock. Because the emulation pod does not have a power supply, design your system so that the emulator MCU is powered by the target system.
  - When debugging with M38000TL2-FPD, use either an open-drain type reset IC or a CR reset circuit. The recommended pull-up value is about 10kΩ. The MCU can be reset by outputting "L" to the target through the reset clip on the M38000TL2-FPD. However, if the reset circuit on the target is an H-output type RESET IC, it cannot be set to "L" and the emulator will not operate properly.

    For processing the RESET pin, refer to "3.7 Reset Circuit of the Target System" (page 30).

**⚠CAUTION**

**Note on the Self-check:**

- If the self-check does not result normally (excluding target system errors), the emulation pod may be damaged. Contact your local distributor.

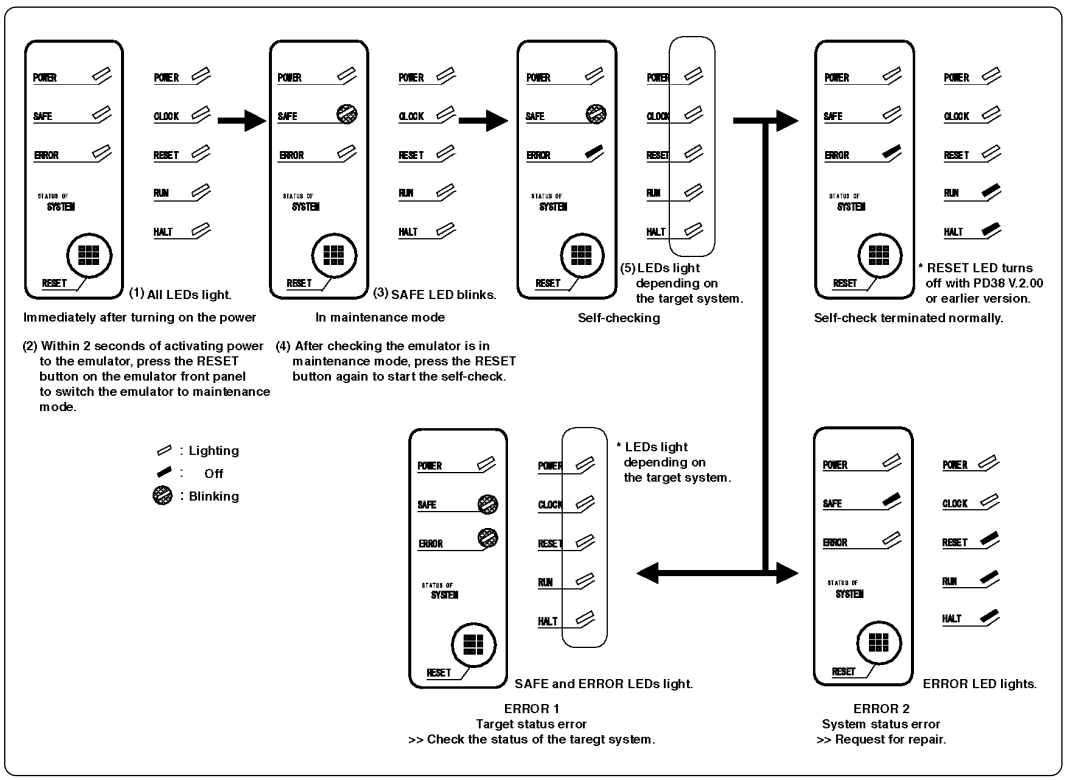

POWER
SAFE
ERROR
STATUS OF SYSTEM
RESET
CLOCK
RESET
RUN
HALT
(1) All LEDs light.
Immediately after turning on the power
(2) Within 2 seconds of activating power to the emulator, press the RESET button on the emulator front panel to switch the emulator to maintenance mode.
(3) SAFE LED blinks.
In maintenance mode
(4) After checking the emulator is in maintenance mode, press the RESET button again to start the self-check.
(5) LEDs light depending on the target system.
Self-checking
* RESET LED turns off with PD38 V.2.00 or earlier version.
Self-check terminated normally.
: Lighting
: Off
: Blinking
* LEDs light depending on the target system.
SAFE and ERROR LEDs light.
ERROR 1
Target status error
>> Check the status of the taregt system.
ERROR LED lights.
ERROR 2
System status error
>> Request for repair.

*Figure 4.3 LED display when self-checking*

# Chapter 5. Specifications

This chapter describes specifications of this product.

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(1) External Dimensions of the Emulation Pod ..... 39
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# Chapter 5. Specifications

## 5.1 Specifications

Table 5.1 lists the specifications of the M38000TL2-FPD.

*Table 5.1 Specifications of the M38000TL2-FPD*

| | | |
|---|---|---|
| Emulator | PC4701 | |
| Applicable MCUs | 740 Family MCUs which have an emulator MCU | |
| Usable modes | Single-chip mode<br>Memory expansion mode<br>Microprocessor mode | |
| Emulation memory | 64 KB | |
| Maximum operating frequency | 16 MHz (Vcc = 5.0 V)*1 | |
| Applicable power voltage | RSS/RFS type | 2.0 - 5.5 V*2 |
| | RLSS/RLFS type*3 | 0.9 - 5.5 V*2 |
| Stack capacity of emulator | Max. 3 bytes | |
| MCU addresses of emulator | 38000 Series | 2 addresses $FFFE, $FFFF |
| | Other than 38000 Series | 2 addresses $8000, $8001 |
| Operating temperature | 5 to 35°C (no dew) | |
| Storage temperature | -10 to 60°C (no dew) | |
| Power supply to emulation pod | Supplied from PC4701 | |
| Connection to target system | Connected via the emulator MCU which varies depending on the MCU, probe direction converter board and the flexible cable for connecting the target system. For the connection, refer to " 3.4 Connecting the Emulator MCU" (page 23). | |
| International standards | U.S. EMI standards (FCC part 15 Class A)<br>CE marking (EN55081-1, EN55082-1) | |

*1 Subject to limits depending on MCU's specifications. However, the maximum operating range is 16.8 MHz only for the M38049RLSS MCU.

*2 Subject to limits depending on MCU's specifications.

*3 RLSS/RLFS represent the emulator MCUs that can operate with supply voltages below 2.0 V.

## 5.2 External Dimensions

### (1) External Dimensions of the Emulation Pod

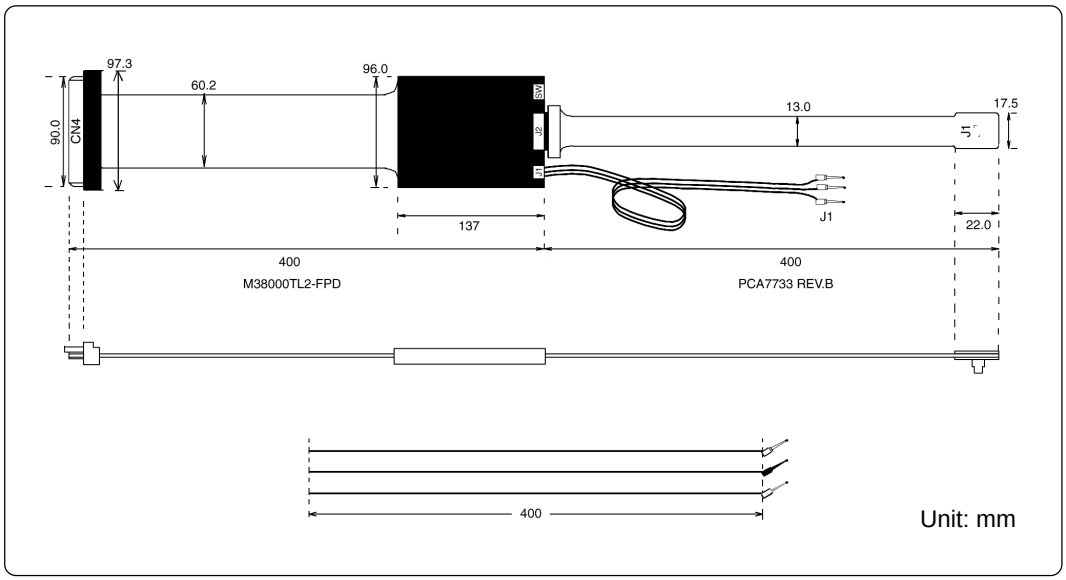


*Figure 5.1 External dimensions of the emulation pod*

### (2) External Dimensions of the Converter Board (28DP-WS)

Figure 5.2 shows the external dimensions of the converter board 28DP-WS for connecting the RSS type emulator MCU.

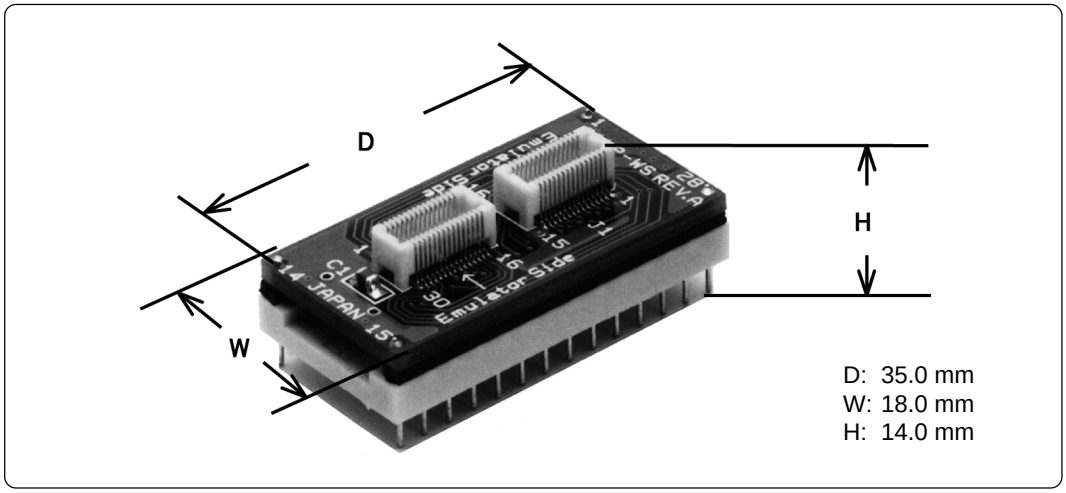


*Figure 5.2 External dimensions of the converter board 28DP-WS*

### (3) External Dimensions of the Converter Board (32LCC-S)

Figure 5.3 shows the external dimensions of the converter board 32LCC-S for connecting the RFS type emulator MCU.

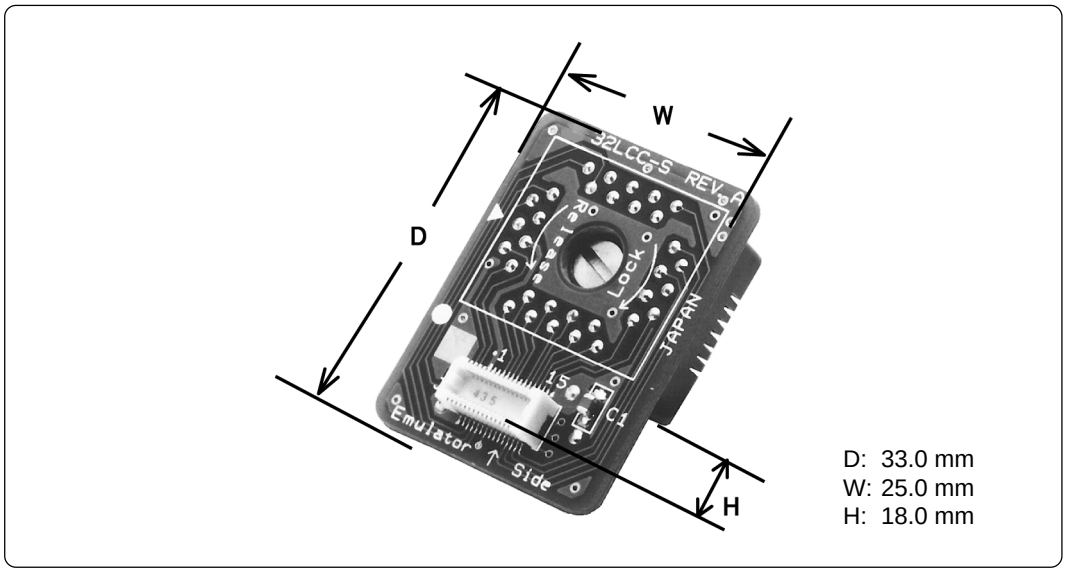


*Figure 5.3 External dimensions of the converter board 32LCC-S*

# Chapter 6. Troubleshooting

This chapter describes how to troubleshoot when this product does not work properly.

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# Chapter 6. Troubleshooting

## 6.1 Flowchart to Remedy the Troubles

Figure 6.1 shows the flowchart to remedy the troubles from when power to the emulator is activated until emulator debugger M3T-PD38 starts up (Program Window displayed).

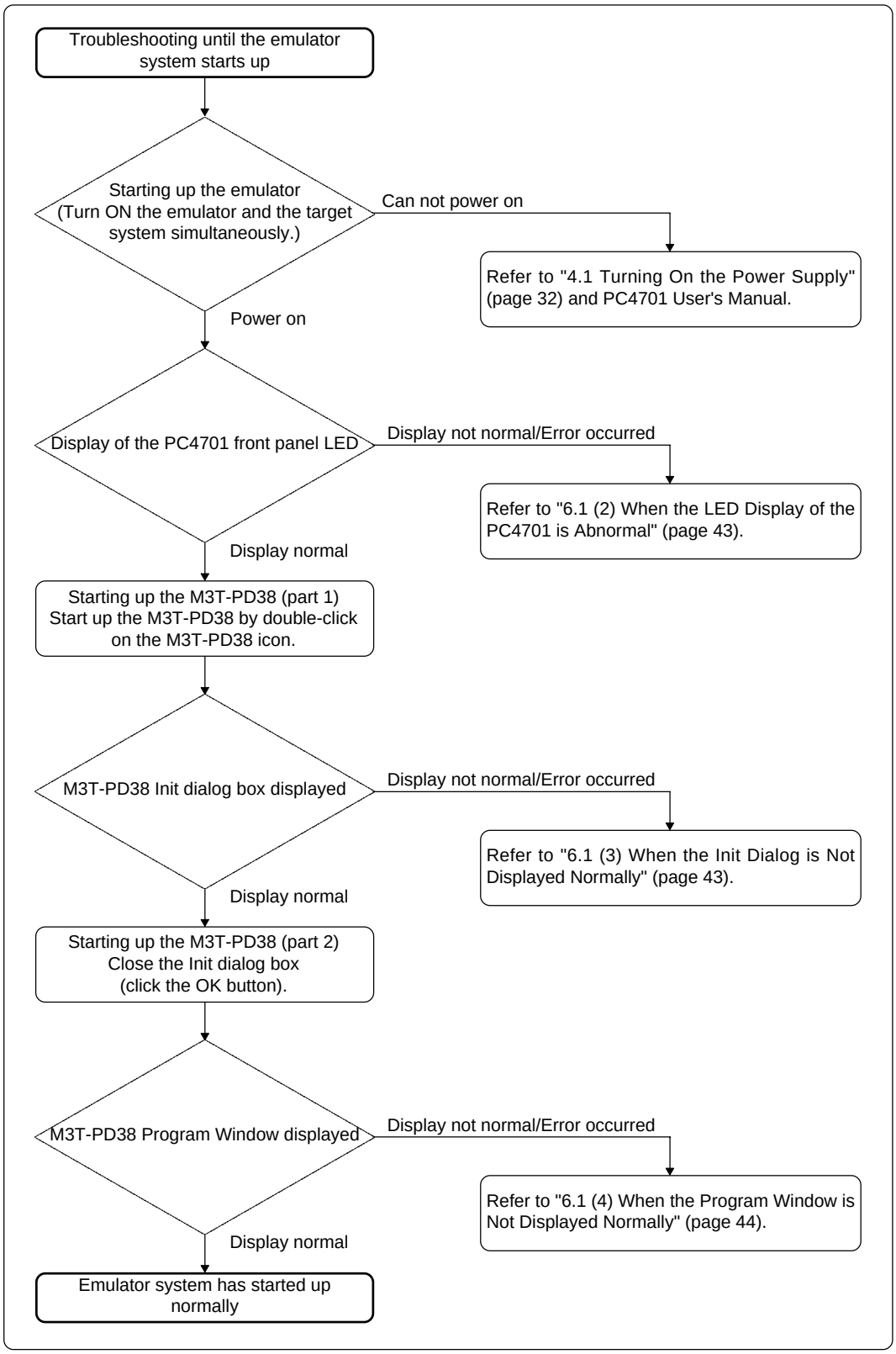
Troubleshooting until the emulator system starts up
Starting up the emulator (Turn ON the emulator and the target system simultaneously.)
Can not power on
Refer to "4.1 Turning On the Power Supply" (page 32) and PC4701 User's Manual.
Power on
Display of the PC4701 front panel LED
Display not normal/Error occurred
Refer to "6.1 (2) When the LED Display of the PC4701 is Abnormal" (page 43).
Display normal
Starting up the M3T-PD38 (part 1) Start up the M3T-PD38 by double-click on the M3T-PD38 icon.
M3T-PD38 Init dialog box displayed
Display not normal/Error occurred
Refer to "6.1 (3) When the Init Dialog is Not Displayed Normally" (page 43).
Display normal
Starting up the M3T-PD38 (part 2) Close the Init dialog box (click the OK button).
M3T-PD38 Program Window displayed
Display not normal/Error occurred
Refer to "6.1 (4) When the Program Window is Not Displayed Normally" (page 44).
Display normal
Emulator system has started up normally

*Figure 6.1 Troubleshooting when starting up the emulator system*

### (1) When the PC4701 is Not Powered On

*Table 6.1 Checkpoints when the PC4701 is not powered on*

| Error | Checkpoint |
|---|---|
| The PC4701 can not be powered on. | • Recheck the connection between the PC4701 and the power cable.<br>*See "4.1 Turning On the Power Supply" (page 32) and PC4701 User's Manual.* |

### (2) When the LED Display of PC4701 is Abnormal

*Table 6.2 LED's abnormal display and its checkpoints*

| Error | Checkpoint |
|---|---|
| LEDs do not light up. | • Recheck the connection between the PC4701 and the power cable.<br>*See "4.1 Turning On the Power Supply" (page 32) and PC4701 User's Manual.* |
| All LEDs remain lit. | • Recheck the connection between the PC4701 and this product.<br>*See "3.3 Connecting the PC4701" (page 22).* |
| The CLOCK LED of "STATUS OF TARGET" does not light up. | • Check the oscillator circuit of the target system is working properly. |
| The POWER LED of "STATUS OF TARGET" does not light up. | • Connect the target system properly. For debugging an emulator MCU, the emulator system does not start up when not connecting the target system.<br>*See "3.4 Connecting the Emulator MCU" (page 23) and "3.5 Connecting the Target System" (page 26).*<br>• Check power is properly supplied to the target system and the target system is properly grounded. |
| The display of RESET LED of "STATUS OF TARGET" is not normal. | • Check whether the target system's reset pin is stuck low.<br>• Check how to process the RESET pin.<br>*See "3.7 Reset Circuit of the Target System" (page 30).*<br>*The contents indicated by the RESET LED vary with the version of M3T-PD38. For LED indications in normal state, refer to "4.1 (3) LED Display When the PC4701 Starts Up Normally" (page 33).* |
| Others | • The firmware version may be different. Please download the firmware in maintenance mode.<br>*See "4.2 (2) Downloading Firmware in Maintenance Mode" (page 34).*<br>• The MCU may not be reset.<br>*See "3.7 Reset Circuit of the Target System" (page 30).* |

### (3) When the Init Dialog is Not Displayed Normally

- Check the operation environment of the host machine where the M3T-PD38 is operating.
- M3T-PD38 may not have been installed properly. Reinstall the M3T-PD38.

### (4) When the Program Window is Not Displayed Normally

*Table 6.3 Checkpoints of errors when starting up the emulator debugger*

| Error | Checkpoint |
|---|---|
| The emulation pod is not connected to the target system. | • The emulator system and host are not communicating normally.<br>*Check the connection between the emulator and the host machine.*<br>*Check the I/F switch on the rear of the emulation pod.*<br>*Check the I/F setting of the Init dialog.*<br>*Check the description of the environment setting file (.ini) and startup option.* |
| The emulation pod cannot be connected to the target system. | |
| Communication error occurred.<br>Data was not sent to the target. | |
| Communication error occurred.<br>Data was not received from the target. | |
| Target system cannot be properly built. | • The emulator system is not operating properly.<br>*Download the proper firmware.*<br>*See "4.2 Downloading Firmware" (page 34).*<br>• Recheck the connection between the PC4701 and this product.<br>*See "3.3 Connecting the PC4701" (page 22).* |
| M3T-PD38 version is not the same version as the firmware in the target. | • The firmware is not compliant with the emulation pod. Download the proper firmware.<br>*See "4.2 Downloading Firmware" (page 34).* |
| Target MCU cannot be reset.<br>Reset the target system. | • The MCU reset control performed inside the emulator was not processed normally.<br>*See "3.7 Reset Circuit of the Target System" (page 30).*<br>*See "6.2 When an Error Message "Cannot be reset" is Displayed" (page 45).* |

## 6.2 When an Error Message "Cannot be reset" is Displayed

When an error message "Target MCU cannot be reset. Reset the target system." is displayed at the time of starting up the M3T-PD38, check the following:

(1) The firmware does not match the emulation pod used.
Are the firmware names conforming to the emulation pod (see the manual for details) written in the MCU file? If the emulator debugger shows an instruction for downloading the firmware when it started up, download the firmware that matches the emulation pod according to the displayed message.

(2) The contents of the MCU file are different.
After consulting the user's manual of your emulator debugger, correct the contents of the MCU file with a text editor.

(3) Is an incorrect MCU file selected?
From the Init dialog box that is displayed when M3T-PD38 starts, select the correct MCU file that suits the emulator MCU used.

(4) Is the target system supplied with the correct power, clock, and reset?
Power supply voltage: Check whether it is within the rated voltage range of the emulation pod and MCU.

Clock: Check whether the clock is oscillating correctly.

Reset:
a) If the reset circuit of the target system has a watchdog timer function, disable the watchdog timer function while using the emulator.
b) When the reset circuit on the target is an H-output type RESET IC: When debugging with M38000TL2-FPD, use either an open-drain type reset IC or a CR reset circuit. The recommended pull-up value is about 10kΩ. The MCU can be reset by outputting "L" to the target through the reset clip on the M38000TL2-FPD. However, if the reset circuit on the target is an H-output type RESET IC, it cannot be set to "L" and the emulator will not operate properly.

(5) Because the emulator main unit, emulation pod, emulator MCU, and target system are not firmly connected, imperfect contact exists in one of these connections. Connect these pieces of equipment firmly again.

(6) Check to see if the GND and RESET cables from the M38000TL2-FPD are correctly connected to the target system.

(7) If none of the above holds true, the hardware or the emulator MCU may be faulty. Please contact your local distributor.

## 6.3 When an Error is Detected in the Self-check

Before starting the self-check, the emulator PC4701 check the status of the emulation pod, firmware and target system. When the self-check does not result normally, see "4.3 Self-check (2) If an Error is Detected in the Self-check" (page 35).

With the emulator debugger M3T-PD38 V.3.00 Release 1 or later, the RESET LED remains on under normal conditions.

The firmware in M3T-PD38 V.3.00 Release 1 and later has been modified so that the MCU goes to reset status immediately after startup. Therefore, RESET LED and others will turn on at the time of normal startup, as described below.

| LED | Status |
|---|---|
| POWER | ON when target connected, OFF when disconnected |
| CLOCK | ON |
| RESET | ON |
| RUN | OFF |
| HALT | OFF |

When M3T-PD38 is started up under normal conditions, the MCU is released from reset mode and the RESET LED is turned OFF.

## 6.4 When the M38000TL2-FPD Does Not Work Properly

Check the following when the M38000TL2-FPD does not work properly.

- ☐ Check whether the PC4701 and M38000TL2-FPD are connected properly via the 120-pin flexible cable. For the connection, refer to "3.3 Connecting the PC4701" (page 22).
- ☐ Check whether the switches of the emulation pod are properly set. For the switch settings, refer to "3.1 Switch Settings" (page 20).
- ☐ Check whether the MCU file is properly set.
- ☐ Check whether the mapping information is properly set. Always set the internal SFR area and internal RAM area to "External". However, when the RAM area of the target MCU is larger than the RAM in the emulator MCU (e.g. M38199MF), set the area to "Internal".

| Area | Mapping |
|---|---|
| SFR area | External |
| Internal RAM area | External |
| Internal ROM area | Internal |
| External memory area | External<br>(only for memory expansion and microprocessor modes) |

- ☐ Check whether power (within the MCU's specified range and between +0.9 and 5.5 V) and GND are supplied to the target system.
- ☐ Check whether the oscillator on the target system is oscillating properly.
- ☐ Check whether the RESET* pin is High.
- ☐ Check whether the HOLD* pin is High.
- ☐ Check whether the RDY* pin is High.

## 6.5 FAQs

Here following are frequently asked questions for using this product other than the troubles shown in the antecedent. For the latest FAQs, refer to the URL below.

**http://www.renesas.com/en/tools**

**Q. 1**

The maximum operating frequency of 3803 and 3804 Group MCUs is 16.8 MHz, yet the maximum operating frequency of the M38000TL2-FPD is 16.0 MHz. Does this emulation pod really operate at 16.8 MHz?

**A. 1**

This emulation pod works at 16.8 MHz (@5 V) when the pod is used exclusively with the M38049RLSS emulator MCU. Other than this combination, the maximum frequency of the emulation pod is 16.0 MHz. (@5 V).

**Q. 2**

When I tried to change the selected clock using a script command, a message "Internal" was displayed and the clock could not be changed.

**A. 2**

The M38000TL2-FPD is designed to use the target system's oscillator circuit for its oscillation clock source. Therefore, any attempt to change the clock source by entering CLK command from the Init dialog box that is displayed when the emulator debugger starts or from the script window has no effect. Although you see the message "Internal" on the script window, the emulation pod actually is always operating External.

**Q. 3**

The MCU being debugged has 2K bytes of internal RAM area (40h--83Fh). However, data at addresses above 440h cannot be modified. How can the data be modified?

**A. 3**

The emulator MCU's internal RAM area may happen to be smaller than that of the target MCU. In such a case, data in areas nonexistent in the emulator MCU cannot normally be modified. Therefore, use the MAP command from the script window to set addresses 440h--83Fh for Internal. When MAP settings are changed for Internal, the memory space on the emulation pod is accessed. In this way, data at RAM memory addresses 440h--83Fh can be modified.

## 6.6 How to Request for Support

After checking the items in "Chapter 6 Troubleshooting", fill in the text file the installer of the emulator debugger generates in the following directory and email to your local distributor.

\SUPPORT\product name\SUPPORT.TXT

For prompt response, please specify the following information:

(1) Operating environment

- Operating voltage: X.X [V]
- Operating frequency: XX.X [MHz]
- Emulator MCU type name:

(2) Condition

- The emulator debugger starts up/does not start up
- The error is detected/not detected in the self-check
- Frequency of errors: always/frequency ( )

(3) Problem

# MEMO

# Chapter 7. Maintenance and Guarantee

This chapter describes how to maintenance, repair provisions and how to request for repair.

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7.2 Guarantee ..... 50
7.3 Repair Provisions ..... 50
7.4 How to Request for Repair ..... 51

# Chapter 7. Maintenance and Guarantee

## 7.1 Maintenance

If dust or dirt collects on any equipment of your emulation system, wipe it off with a dry soft cloth. Do not use thinner or other solvents because these chemicals can cause the equipment's surface coating to separate.

## 7.2 Guarantee

If your product becomes faulty within twelve months after its purchase while being used under good conditions by observing "Precautions for Safety" described in Chapter 1 of this user's manual, we will repair or replace your faulty product free of charge. Note, however, that if your product's fault is raised by any one of the following causes, we will repair it or replace it with new one with extra-charge:

- Misuse, abuse, or use under extraordinary conditions
- Unauthorized repair, remodeling, maintenance, and so on
- Inadequate user's system or misuse of it
- Fires, earthquakes, and other unexpected disasters

In the above cases, contact your local distributor. If your product is being leased, consult the leasing company or the owner.

## 7.3 Repair Provisions

(1) Repair with extra-charge

The products elapsed more than twelve months after purchase can be repaired with extra-charge.

(2) Replacement with extra-charge

If your product's fault falls in any of the following categories, the fault will be corrected by replacing the entire product instead of repair, or you will be advised to purchase new one, depending on the severity of the fault.

- Faulty or broken mechanical portions
- Flaw, separation, or rust in coated or plated portions
- Flaw or cracks in plastic portions
- Faults or breakage caused by improper use or unauthorized repair or modification
- Heavily damaged electric circuits due to overvoltage, overcurrent or shorting of power supply
- Cracks in the printed circuit board or burnt-down patterns
- Wide range of faults that makes replacement less expensive than repair
- Unlocatable or unidentified faults

(3) Expiration of the repair period

When a period of twelve months elapses after the model was dropped from production, repairing products of the model may become impossible.

(4) Transportation fees at sending your product for repair

Please send your product to us for repair at your expense.

## 7.4 How to Request for Repair

If your product is found faulty, follow the procedure below to send your product for repair.

**Customer**

Fill in the Repair Request Sheet included with this product, then send it along with this product for repair to your local distributor. Make sure that information in the Repair Request Sheet is written in as much detail as possible to facilitate repair.

**Distributor**

After checking the contents of fault, the distributor should please send the faulty product along with the Repair Request Sheet to Renesas Solutions Corp.

**Renesas Solutions**

When the faulty product is repaired, it will be returned to the customer at the earliest convenience.

**⚠ CAUTION**

### Note on Transporting the Product:

- When sending your product for repair, use the packing box and cushion material supplied with this product when delivered to you and specify handling caution for it to be handled as precision equipment. If packing of your product is not complete, it may be damaged during transportation. When you pack your product in a bag, make sure to use conductive polyvinyl supplied with this product (usually a blue bag). When you use other bags, they may cause a trouble on your product because of static electricity.

# MEMO

# M38000TL2-FPD User's Manual

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# M38000TL2-FPD
# User's Manual

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